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THE RESISTANCE OF THE YOUNG CALF TO DISEASE

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From November, 1948, to November, 1949, Ayrshire calves were kept at the Institute, and during the first two weeks of life subjected to variations in management and feeding, in the hope of obtaining information on the cause or causes of illness, and mortality during the first two weeks of life.

The calves were collected soon after birth from neighbouring farms, where the statements of those in charge of the animals as to whether there had, or had not, been an opportunity for the calf to obtain colostrum could be relied upon. Calves received wet, were dried by rubbing with clean straw. The animals were housed each in one of a row of small loose boxes with cement floors and cement-rendered walls. Unless otherwise stated a liberal quantity of straw was provided as bedding. On or soon after receipt the calves received a meal from a bottle. Thereafter the animals were fed twice daily, being trained to drink from the bucket as early as possible. Milk from cows kept at the Institute was fed within less than two hours of milking. When colostrum was fed it was generally the pooled colostrum from two of the eight herds, A and D, supplying the calves. The colostrum from the first two milkings after calving was pooled and no samples showing a high bacterial count were used. The colostrum was kept in cartons at −15° C., and before feeding an appropriate number of cartons were thawed and their contents poured into litre screw-capped bottles. The colostrum was then heated in a water bath at 58° C. for two hours. The " pasteurised " colostrum was kept in the cold room for periods of not longer than one week before feeding.

The amount of milk fed to the calves daily during the first week was equivalent in weight to 10 per cent. of the animals' bodyweight. In some cases this amount was increased to 12 and 15 per cent. during the second week. The amount of milk fed however, had, no obvious influence on the weight gains shown by the calves and, therefore, variations in the amounts fed are not recorded in the tables. In a few cases where the calf was suffering from diarrhoea or otherwise ill the full 10 per cent. of milk was not consumed daily.

The intervals between the birth of the calf and its receipt at the laboratory varied by a number of hours, but no evidence was obtained indicating that differences in the interval between birth and receipt, nor the condition whether wet or dry, influenced the health of the animals. Accordingly particulars on these points have been omitted. The body temperatures of the calves were taken daily but temperature records provided no useful information.

In the tables a record is given of the weight of the calves on arrival at the Institute, together with the percentage gain or loss in weight at the 14th day for the animals surviving at that time. Marks are also shown for each surviving calf. These were awarded as follows:— For each day from the 2nd to the 14th inclusive two marks were given when the animal was alert and vigorous ; one mark was awarded where vitality appeared to be less than normal but the animal could not be classified as dull ; when the calf was dull and lethargic no mark was given. Depending on the daily condition of the faeces, marks were similarly awarded ; two when the faeces were normal, one when they were soft but not diarrhoeic, and no mark was given when the calf had diarrhoea.

Visible blood and mucus, either together or alone, were not infrequently mingled with the faeces. The presence of blood has been noted in the tables, but marks were not deducted for the presence of either blood or mucus. The total number of marks possible for each calf was 52. The calves were numbered consecutively as they were received, and in the tables and text all the animals are accounted for.

Table I shows the results of feeding calves with (a) the dam's colostrum, (b) pooled colostrum, (c) dam's colostrum plus pooled colostrum. Pooled colostrum was apparently a satisfactory substitute for the dam's colostrum. Furthermore, two animals receiving pooled colostrum, Nos. 6 and 7, were fed milk at a temperature of 20° C. With calf No. 6 the feeding of cold milk began on the fourth day and with calf No. 7 on the fifth day. Despite this departure from accepted good animal husbandry the two calves remained in good health.

Colostrum was withheld from six calves born during the period December 24th to January 22nd. One calf, No. 21, was killed *in extremis* on the third day. Another, No. 19, survived the experimental period but was slaughtered on the 24th day by which time it was gaining weight. The animal had remained recumbent the greater part of the time and at *post-mortem* examination an arthritis of the limbs was found, but no bacteria could be demonstrated in the affected joints. The remaining four calves showed a lower standard of health than those that had been fed with colostrum. The four colostrum-deprived calves were kept for a third week and improved in health and vigour. Data on the colostrum-deprived calves are shown in Table II.

On the third day of life the greater part of the bedding was removed from the boxes of six calves born during the period January 22nd to February 8th. Only a thin incomplete layer of straw was left through which the cement floor showed. This scanty bedding became saturated with urine in four to five days and was changed once in the two weeks.

In Table III a comparison of the results obtained from calves scantily bedded and calves abundantly bedded is shown. All the calves received pooled colostrum. During the period the weather was on the whole mild, but on seven nights from January 25th until February 22nd, when the

experiment ended, the minimum temperatures recorded in the loose boxes at a level of 6 feet from the floor fell to freezing point or lower. Nevertheless, no fatalities occurred among the calves and only one of the six on scanty bedding failed to gain in weight. This animal, No. 24, although it had diarrhoea on four days, was not suffering from diarrhoea when it was slaughtered on the 14th day and a *post-mortem* and bacteriological examination made. From the clinical condition and the results of the examinations it was concluded that the animal would have had good health had it been allowed to live.

Keeping calves under cold and damp conditions furnished no evidence that thereby they were rendered susceptible to disease and early death. It may be noted, however, that despite the feeding of pooled colostrum many of the calves showed blood in the faeces.

It is of interest to compare the performance of the calves supplied with abundant bedding and shown in Table III with that of comparably managed animals (those receiving pooled colostrum) shown in Table I. The latter, which were born in November and December, appeared to attain the higher standard of health and vigour, and this was more readily noted from the appearance and general behaviour of the animals than from the data shown in the tables.

Cultures of *Bacterium coli* were fed to calves born from February 17th until March 3rd. Equal quantities of three strains of *Bact. coli* isolated from calves were fed. The strains were grown on agar, the surface growth washed off with saline and standardised to a constant opacity. These suspensions were kept in the cold room until fed up to the fourth day after preparation, viability tests having

TABLE I

THE RESULTS OF FEEDING COLOSTRUM TO CALVES BORN IN NOVEMBER AND DECEMBER

FED UNKNOWN QUANTITY OF DAM'S COLOSTRUM

Calf No.	Farm	Dam's colostrum		Weight in lbs., first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days
		No. of meals	Total amount fed in litres								
8	C	—	—	62	6	—	51	—	—	—	—
9	C	—	—	55	15	—	45	—	—	—	—
11	H	—	—	72	11	—	48	—	—	—	—
20	A	—	—	79	4	—	40	—	—	—	—

FED POOLED COLOSTRUM

Calf No.	Farm	Pooled colostrum		Weight in lbs. first days of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days	Remarks
		No. of meals	Total amount fed in litres									
4	A	4	4·2	74	16	—	52	+	1	—	—	
6	A	4	4·2	79	25	—	52	—	—	—	—	Fed cold milk
7	D	5	4·6	73	15	—	47	—	—	—	—	" "
10	D	4	3·9	80	10	—	52	—	—	—	—	
12	H	5	4·2	79	11	—	48	—	—	—	—	
13	C	5	4·4	83	4	—	48	—	—	—	—	

FED UNKNOWN QUANTITY OF DAM'S COLOSTRUM AND POOLED COLOSTRUM

Calf No.	Farm	Pooled colostrum		Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days
		No. of meals	Total amount fed in litres								
1	B	—	4·2	89	14	—	52	—	—	—	—
2	A	5	4·2	78	4	—	52	—	—	—	—
3	A	4	3·6	78	18	—	52	—	—	—	—
5	B	4	3·5	65	15	—	52	—	—	—	—
14	A	—	1	69	4	—	50	—	—	—	—

TABLE II

FIVE CALVES BORN IN DECEMBER AND ONE CALF BORN IN JANUARY AND DEPRIVED OF COLOSTRUM

Calf No.	Farm	Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days	Remarks
15	C	62	—	3	27	—	—	+	1	
16	E	88	6	—	42	—	—	—	—	
17	C	78	—	—	33	+	1	—	—	
18	C	82	6	—	46	—	—	—	—	
19	A	85	—	2	16	+	4	—	—	Slaughtered on the 24th day. *Post-mortem* examination made
21	E	60	—	—	—	—	—	—	—	Killed third day

shown no detectable decrease in the number of live bacteria over that time and longer periods.

Table IV shows that administering large numbers of viable *Bact. coli* along with the food caused little or no disturbance in health. Even calf No. 50, which was fed cultures of *Bact. coli* at every meal from the second day, had diarrhoea on 13th day only, but from then until the 18th day when observations on the animal were discontinued it was healthy.

It was planned to feed cultures of *Bact. coli* to colostrum-deprived calves and an experiment was begun early in March, but was discontinued as the control animals, which had not received colostrum, died. Accordingly observations on the effect of withholding colostrum from calves born from March 5th to 11th were made and the results are shown in Table V. All seven calves that were not given *Bact. coli* in the food died or were killed *in extremis* on the second or third day. These results are in striking contrast to those obtained with calves deprived colostrum but born in December and with calves born in July (see Table X), which latter had a high standard of health.

Table III

Calves Born from January 22nd to February 8th

Calves with Abundant Bedding

Calf No.	Farm	Pooled colostrum: No. of meals	Pooled colostrum: Total amount fed in litres	Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days
22	A	5	3·9	74	15	—	47	+	1	—	—
23	A	4	3·6	86	10	—	49	—	—	—	—
25	F	5	3·5	66	6	—	47	—	—	—	—
27	A	5	4·1	71	8	—	52	—	—	—	—
29	H	5	4·1	74	10	—	50	—	—	—	—
32	A	5	3·9	75	—	—	43	+	3	+	1
33	E	5	3·5	64	9	—	44	—	—	—	—
34	D	5	4·7	93	—	2	27	+	2	+	1
36	C	5	3·9	71	—	—	41	+	1	—	—
					Calves with Scanty Bedding						
24	G	5	3·5	64	—	6	36	+	3	+	4
26	C	5	3·1	82	10	—	52	—	—	—	—
28	A	5	3·5	58	5	—	44	+	3	+	1
30	A	4	2·9	70	14	—	50	+	1	—	—
35	A	5	3·5	63	11	—	40	+	3	—	—
37	A	5	4·2	70	9	—	41	+	1	—	—

Table IV

Calves Born from February 13th to March 2nd

Fed Cultures of *Bact. coli*

Calf No.	Farm	Pooled colostrum: No. of meals	Pooled colostrum: Total amount fed in litres	Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days	Days of life when fed culture	No. of feeds of culture	Approximate No. of bacteria fed in billions
38	A	3	2	67	—	—	28	—	—	+	1	2 and 3	2	6·5
40	F	3	2·3	73	1	—	51	—	—	—	—	3	2	6·5
42	A	3	2·4	83	4	—	51	—	—	—	—	2 and 3	3	9·75
43	G	1	0·5	69	—	2	41	—	—	+	3	2 and 3	2	6·5
45	D	3	2·4	82	4	—	46	+	1	—	—	2 and 3	2	6·5
47	F	3	2	60	5	—	43	—	—	—	—	2 and 3	2	6·5
49	A	*		68	12	—	52	—	—	—	—	2 and 3	2	6·5
50	A	*		74	5	—	41	—	—	—	—	14	27	87·75

* Fed dam's colostrum at farm. In these tables a billion is a million million.

Controls

Calf No.	Farm	Pooled colostrum: No. of meals	Pooled colostrum: Total amount fed in litres	Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days
37	G	3	2·2	68	6	—	50	—	—	—	—
39	H	3	2·4	82	1	—	47	+	1	—	—
41	G	3	2·3	74	—	—	44	+	2	—	—
44	G	2	1·7	74	—	—	48	—	—	—	—
46	C	3	2·3	72	6	—	47	—	—	—	—
48	A	3	2·0	69	2	—	41	+	1	+	1

In the treatment of scours, and in the attempted prevention of mortality in young calves, it is a common practice to feed milk diluted with water. This practice suggested the feeding of milk whey in place of colostrum, and a number of calves born from March 12th to 19th were treated in this manner (Table VI). It was found at this time of the year that whey could not be substituted for colostrum. Nevertheless, the whey-fed calves survived for a few days longer than had those shown in Table IV which were fed milk only.

Feeding cow serum has been recommended by Smith and Little (1930) as a substitute for feeding colostrum. An experiment was undertaken to test the value of feeding calf serum obtained from the abattoir and collected from calves a few days old. The calves supplying the serum had in all probability received colostrum and their sera might be expected to be rich in " immune bodies " derived from it.

Four calves born from March 24th to 28th were used. Three, Nos. 70, 71 and 72, received at each of their first three meals 250 c.c. of calf serum plus 250 c.c. of milk. The fourth calf, No. 73, was fed milk only but on the first and again on the second day received a subcutaneous inoculation of 250 c.c. of calf serum.

Calf No. 70 died on the sixth day and Nos. 71 and 72 were killed *in extremis* on the sixth day. The faeces of No. 70 remained normal but with calves No. 71 and 72 blood was present in the faeces during the third and fourth

Table V

Calves Born from March 5th to March 12th

Calves Deprived of Colostrum

Calf No.	Farm	Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days	Remarks
51	G	90	—	—	—	—	—	—	—	Died 3rd day
53	G	70	—	—	—	—	—	+	1	„ 2nd „
55	G	86	—	—	—	—	—	—	—	„ 3rd „
56	G	74	—	—	—	—	—	—	—	„ 2nd „
58	A	79	—	—	—	—	—	—	—	„ 3rd „
59	C	100	—	—	—	—	—	—	—	Killed 2nd day
60	C	80	—	—	—	—	—	—	—	Died 2nd day

Calves Deprived of Colostrum and Fed Cultures of *Bact. coli*

Calf No.	Farm	Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days	Days of life when fed culture	No. of feeds of culture	Approximate No. of bacteria fed in billions	Remarks
52	D	77	—	—	—	—	—	—	—	2 and 3	2	6·5	Killed 5th day
57	A	67	—	—	—	—	—	—	—	2	2	6·5	„ 2nd „

Calf No. 54 not shown in the tables was fed 0·5 litres of pooled colostrum. The calf weighed 90 lb. on the first day. It gained 4 per cent. in weight, and scored 46 marks. The calf had diarrhoea on one day; blood was not present in the faeces.

Table VI

Calves Born from March 13th to 19th. Calves Fed Milk Whey as a Substitute for Colostrum

Calf No.	Farm	Milk whey		Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. days	Remarks
		No. of meals	Total amount fed in litres									
61	G	3	2·5	78	—	—	—	+	2	+	1	Killed 9th day
62	G	3	1·5	95	—	—	—	+	1	+	2	„ 11th „
63	D	3	1·5	72	—	—	—	—	—	—	—	Died 5th day
64	F	2	1	70	—	—	—	—	—	—	—	„ 4th „
65	G	3	1·5	79	—	—	—	—	—	—	—	Killed 4th day
66	A	3	1·5	65	—	8	38	+	2	—	—	
67	G	3	1·5	86	—	—	—	—	—	—	—	„ 3rd „
68	G	No colostrum		70	—	—	—	+	3	+	1	Died 8th day
		Pooled colostrum										
69	D	3	1·5	81	7	—	42	—	—	+	2	

No. 68 was fed milk only and No. 69 was fed with pooled colostrum.

days, and during the last two days of life both animals had diarrhoea. The calf injected subcutaneously with serum remained well but neither gained nor lost weight. At no time were the faeces diarrhoeic and it scored 43 marks. Further experiments on the feeding of calf serum were not made but it was evident that feeding calf serum in the amounts given was not a satisfactory substitute for the feeding of colostrum.

Aschaffenburg, Bartlett, Kon, Walker, Briggs, Cotchin and Lovell (1949) have shown that the virtue of colostrum as a food for the newly born calf resides in the whey fraction.

Fresh colostrum was treated with rennet, the whey filtered through paper and a Seitz bacteriological filter. Four calves were fed with the whey mixed with an appropriate volume of milk. Others were fed milk only, but were injected subcutaneously with the whey. Data on these calves, which were born from March 28th to April 12th, are presented in Table VII. The results suggest that both the feeding, and the subcutaneous injection of whey from

TABLE VII

CALVES BORN FROM MARCH 28TH TO APRIL 12TH

CALVES FED WITH WHEY FROM COLOSTRUM

Calf No.	Farm	Colostrum whey		Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days	Remarks
		No. of meals	Total amount fed in litres									
74	A	2	0·5	74	—	12	24	+	2	+	5	
78	D	3	0·75	77	—	13	27	—	—	+	4	
82	I	3	0·75	74	—	—	—	—	—	+	1	Died 7th day
86	C	2	0·5	76	—	—	50	—	—	—	—	
		Colostrum										
75	H	3	1·5	93	—	2	39	—	—	+	1	
77	D	3	0·75	79	3	—	44	—	—	+	2	
80	F	3	1·5	68	—	7	31	+	2	+	1	

CALVES INOCULATED SUBCUTANEOUSLY WITH WHEY FROM COLOSTRUM

Calf No.	Farm	Colostrum whey		Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days	Remarks
		No. of inoculations	Total amount inoc. in litres									
76	D	1	0·25	88	—	—	—	+	2	—	—	Died 5th day
79	F	3	0·75	82	—	10	34	—	—	—	—	
81	G	2	0·5	72	—	10	30	—	—	+	4	
85	G	2	0·5	80	—	—	—	—	—	+	2	„ 9th „

TABLE VIII

CALVES BORN FROM APRIL 8TH TO MAY 1ST

CALVES FED COW SERUM

Calf No.	Farm	Cow serum		Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days	Remarks
		No. of meals	Total amount fed in litres									
83	F	2	0·5	74	—	—	—	+	3	+	1	Died 10th day
87	C	2	0·5	68	—	9	31	—	—	+	7	
90	G	3	2·5	71	5	—	44	—	—	+	1	
92	A	3	2·5	76	—	9	42	+	5	—	—	
		Pooled colostrum										
91	C	4	3	70	9	—	47	—	—	—	—	
		Milk only										
93	C	—	—	71	—	—	—	—	—	—	—	Died 3rd day
94	C	—	—	94	—	—	—	+	3	+	2	„ 6th „

CALVES INOCULATED SUBCUTANEOUSLY WITH COW SERUM

Calf No.	Farm	Cow serum		Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days	Remarks
		No. of inoculations	Total amount inoc. in litres									
84	A	2	0·5	69	—	—	—	+	1	+	4	Killed 10th day

colostrum had a protective action. The experiment although inconclusive was not carried further. Very considerable difficulty was encountered in obtaining and filtering the whey, and the yields obtained from some samples of colostrum were so small that they were discarded. It would be of interest to carry out a more extensive test on the comparative values of the two methods of administering the whey.

Four calves born from April 8th to 28th were fed cow serum in place of colostrum and a fifth calf which was fed milk only was injected subcutaneously with cow serum. A further calf born in the same period was fed with pooled colostrum and two calves born on May 1st received milk only. The results shown in Table VIII indicate that feeding cow serum may be of value, but the serum fed was inadequate to maintain a high standard of health. It is also demonstrated that in May, calves deprived of colostrum and receiving no substitute, died.

A further attempt was made to see whether disease could be caused by feeding very large numbers of *Bact. coli* to calves born from April 20th to May 21st. The cultures were from strains of *Bact. coli.* isolated from experimental calves

TABLE IX

CALVES BORN FROM APRIL 20TH TO MAY 21ST

CALVES FED FRESH COLOSTRUM AND VERY LARGE NUMBERS OF *Bact. coli* FROM STRAINS RECENTLY ISOLATED FROM CALVES THAT HAD DIED OR BEEN KILLED WHILST SUFFERING FROM A *Bact. coli* INFECTION

Calf No.	Farm	Fresh colostrum		Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days	Days of life when fed culture	No. of feeds of culture	Approximate No. of bacteria fed in billions
		No. of meals	Total amount fed in litres											
88	C	5	4	78	6	—	51	—	—	—	—	2–14	26	84·5
89	G	5	3	96	2	—	44	—	—	—	—	2–14	26	84·5
95	D	10	12·2	74	9	—	47	—	—	—	—	2–14	26	155
96	B	2	1·5	64	16	—	52	—	—	—	—	6–9	7	70

Calves Nos. 88, 89 and 95 were fed *Bact. coli* at the second and every subsequent meal. No. 96 was fed the organisms on the sixth to eighth days inclusive. Calf 97, a twin to 96, was fed cultures of *Bact. coli* on the fifth evening and sixth morning. The amounts fed were similar to those fed at each meal to calf No. 96. Two and a half hours after the second feed it was killed and its organs were examined. *Bact. coli* was isolated from eleven of the twelve lymph glands draining the small intestine that were examined. It was not found in the liver, spleen or kidney. From the cultural and serological character of the organisms isolated it was concluded that in some instances these were identical with those fed to the calf. It was, therefore, concluded that when *Bact. coli* was fed in large numbers to calves the organisms invaded the calves' tissues, although they might not get further than the lymph glands draining the intestine.

TABLE X

CALVES BORN FROM JULY 3RD TO 11TH

CALVES DEPRIVED OF COLOSTRUM AND FED COW SERUM; CALVES FED POOLED COLOSTRUM AND CALF FED DAM'S COLOSTRUM

Calf No.	Farm	Cow serum		Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days
		No. of meals	Total amount fed in litres								
101	A	4	1	76	9	—	52	—	—	—	—
105	G	4	1	63	14	—	52	—	—	—	—
		Pooled colostrum									
98	J	4	3	84	20	—	52	—	—	—	—
99	E	4	3	70	24	—	52	—	—	—	—
		Dam's colostrum									
102	A	Not known; calf removed from dam shortly after birth		59	14	—	52	—	—	—	—

CALVES FED MILK ONLY AND INOCULATED SUBCUTANEOUSLY WITH COW SERUM, AND CALVES FED MILK AND NOT INOCULATED

Calf No.	Farm	Cow serum		Weight in lbs. first day of life	Per cent. gain in weight at 14th day	Per cent. loss in weight at 14th day	Marks awarded	Blood present	No. of days	Diarrhoea shown	No. of days
		No. of inoculations	Total amount inoc. in litres								
104	G	2	0·5	85	12	—	52	—	—	—	—
100	A	2	0·5	58	26	—	52	—	—	—	—
		Not inoculated									
103	E	—	—	68	15	—	51	—	—	—	—
106	A	—	—	68	12	—	49	+	1	—	—

that had died or had been killed at the Institute. Four calves were fed these cultures. All the calves received fresh colostrum from different individual cows. One calf received its dam's colostrum, the others received colostrum coming from cows out of herds other than these where the calves were born. No ill effects followed the feeding of very large quantities of *Bact. coli* cultures, which were not more than the third subcultures of recently isolated " pathogenic " strains.

A further experiment was made with calves born in July and deprived of colostrum, one purpose of which was to compare the antibody titre of the serum of calves respectively fed, and injected subcutaneously with immune cow serum. At the same time two calves were fed with pooled colostrum, and three others with milk only. Data on the clinical histories of the animals are shown in Table X. It will be seen that all the calves maintained a high standard of health, showing that colostrum is not always of vital necessity to the calf.

When it was apparent that the July calves deprived of colostrum but fed with milk from the cow that calved on May 21st remained well, milk from this cow was cartoned daily from July 25th to August 19th and the cartons were kept in cold storage. Unfortunately the cartons were not marked with each day's date of milking. Four calves born from October 7th to 19th, deprived of colostrum, were fed with this stored milk. The animals lived, and the percentage weight gains for three of them when 14 days old were seven, five and four ; the fourth calf neither gained nor lost in weight.

A calf born on October 29th was fed at its first two meals with stored milk collected between September 21st and the beginning of October. From the second day it was fed with the stored milk collected from July 25th to August 19th. The calf died on the fourth day of life and a coliform organism was cultivated from its bone marrow.

Four calves born during the period from September 8th to 27th were fed with fresh unstored milk from the above cow. Later three calves born from October 20th to 24th were fed in a similar way. Six of these calves died when they were from three to five days old and *Bact. coli* was isolated from the bone marrow in each case. The calf that survived scored 52 marks and gained 15 per cent. in bodyweight. All seven calves were born on the same farm and it appears probable that the calf which maintained vigorous health had had colostrum at the farm.

The results obtained from colostrum-deprived calves are summarised in Table XI. The great variations in the behaviour of the animals are apparent.

A comparison was made between the antibody titre of the serum of July calves fed, and injected with cow serum that contained agglutinins for *Brucella abortus*. The calves fed the serum received 250 c.c. at each of the first four meals ; those injected with serum were given 250 c.c. subcutaneously on the first day and the same amount on the second day of life. The smaller volume of serum administered subcutaneously gave rise to agglutinins in higher titre in the calf serum. In all cases the titre dropped during the third week.

Table XI

Summary of the Results Obtained at Different Periods of the Year with Calves that did not Receive Colostrum

Calves born	No.	Lived	Died	Mean percentage of marks scored by survivors
No colostrum fed ; no supplementary treatment given, fed fresh milk				
December	5	5	0	63
January...	1	0	1	0
March ...	8	0	8	0
May ...	2	0	2	0
July ...	2	2	0	98
September	4	1	3	100
October...	3	0	3	0
No colostrum fed ; fed with milk stored since July and August.				
October...	4	4	0	68
No colostrum fed ; fed for the first two meals with milk stored since July and August, then fed fresh milk				
October...	1	0	1	0
No colostrum fed ; supplementary treatment either the feeding or the subcutaneous inoculation of calf serum ; fed fresh milk				
March ...	4	1	3	83
No colostrum fed ; supplementary treatment either the feeding or the subcutaneous inoculation of cow serum				
April-May	5	3	2	75
July ...	4	4	0	100
No colostrum fed ; fed milk whey at the first two or three meals then fed fresh milk				
March ...	7	1	6	73
No colostrum fed ; supplementary treatment the feeding of cultures of *Bact. coli* ; fed fresh milk				
March ...	2	0	2	0

Table XII

A Comparison of the Titre of Agglutinins against *Brucella abortus* and their Persistance in the Serum of Calves, Deprived of Colostrum, and Injected Subcutaneously or Fed Cow Serum. The Cow Serum had a Titre of 360

Calf No.	Method of administration	Amount of serum given	Day of life when bled and titre of calf serum				
			Before treatment	After treatment			
				1st	2nd	3rd	7th	18th
100	Injected	500 c.c.	—	10	20	20	—
101	Fed	1,000 „	—	10	10	—	—
103	—	None	—	—	—	—	—
104	Injected	500 c.c.	—	20	40	40	20
105	Fed	1,000 „	—	10	10	—	—
106	—	None	—	—	—	—	—
				3rd	4th	5th	9th	21st
102	Fed dam's colostrum		80	80	80	40	10

Post-mortem Examinations

Examinations were made on nine calves slaughtered *in extremis*, and on one animal two hours after death. Significant macroscopic lesions were confined to the alimentary canal and consisted of areas of congestion, with pin-point haemorrhages in the mucous coat. In any one animal the affected area was limited in extent, and its location varied from the duodenum to the rectum. In one case the abomasum presented numerous small haemorrhagic zones, 1 to 2 m.m. in diameter, showing destruction of the superficial layers of the mucous membrane. In two of the animals the urine was turbid, containing large numbers of coliform organisms and desquamated epithelial cells.

Table XIII

Summary of Bacteriological Examinations made at or shortly after death

Treatment of calf	No.	Day of life	Results of bacteriological examination
No colostrum and no supplementary treatment	21	Killed 3rd day	Generalised *Bact. coli* infection
" "	52	" 6th "	Generalised *Bact. aerogenes* and *Bact. coli* infection
" "	59	" 2nd "	All tissues and fluids sterile
" "	62	Bled	Heart blood only cultured, numerous *Bact. coli* colonies on agar
No colostrum fed but fed milk whey	61	Killed 11th day	*Bact. coli* isolated from kidney and urine and from two of six lymph glands draining the small intestine. (Infected glands in region of ileum). All other tissues and fluids were sterile
" "	65	" 10th "	*Bact. coli* isolated from spleen, liver, kidney, portal lymph gland and four of six intestinal lymph glands. The infection was light, the agar cultures showing a few colonies or none
" "	67	" 4th "	Generalised *Bact. coli* infection
No colostrum but fed calf serum	71	" 6th "	" "
" "	72	" 6th "	" "
No colostrum fed but inoculatedwith whey from colostrum	85	Died 9th day	Examined two hours after death. *Bact. coli* infection of urine. The organism was isolated from the heart blood sown into broth and from all nine intestinal lymph glands examined by sowing into the broth medium. From only two of these lymph glands was growth obtained on agar. The spleen, liver, kidney and portal lymph gland were sterile.
No colostrum fed but inoculatedwith cow serum	84	Killed	*Bact. coli* isolated from five of seven intestinal lymph glands examined, infection light. The other tissues were sterile
No colostrum and no supplementary treatment	69	"	Generalised *Bact. coli infection*
" "	109	"	" "

The *post-mortem* examinations made on animals that had been dead for some hours were valueless.

Bacteriological Examinations

In Table XIII a summary is given of the bacteriological examinations made on eleven calves that were slaughtered and on one that died. The organs and fluids examined bacteriologically were the spleen, liver, kidneys, the portal lymph gland, several of the lymph glands draining the small intestine, the heart blood, the bile and the urine. Blood agar, McConkey agar, and broth medium were inoculated with tissue or fluid.

The marrow of a limb bone was examined from 16 carcases several hours old. Coliform organisms were found at 13 of these examinations ; in three instances the bone marrow was sterile.

A number of strains of the coliform organisms isolated from the experimental calves were examined by a limited number of tests. From some calves one strain only was examined, but from others two or more strains were examined. According to the reactions shown by the strains they were arbitrarily differentiated as *Bacterium coli* types 1 to 8, Intermediate types 1 to 4 and *Bacterium aerogenes*.

Key to the Differentiation of Coliform Strains Isolated from Calves

	Type No.	M.R.	V.P.	Growth in citrate	Salicin	Saccharose	Motility
Bact. coli type	1	+	—	—	A. G.	A. G.	+
" "	2	+	—	—	A. G.	A. G.	—
" "	3	+	—	—	A. G.	— —	+
" "	4	+	—	—	A. G.	— —	—
" "	5	+	—	—	— —	A. G.	—
" "	6	+	—	—	— —	A. G.	+
" "	7	+	—	—	— —	A. —	—
" "	8	+	—	—	— —	— —	+
Intermediate type ...	1	+	—	+	A. G.	— —	+
" "	2	+	—	+	A. G.	A. G.	—
" "	3	+	—	+	A. G.	A. G.	+
" "	4	+	—	+	— —	A. G.	+
Bact. aerogenes	1	—	—	+	A. G.	A. G.	—

Table XIV

Showing the Distribution of the Different Coliform Strains where only One Strain from a Calf was Examined

Bact. coli type	1	2	3	4	5	6	7	
No. of times isolated ...	5	2	2	1	1	1	1	
Intermediate type ...	1	2	3	4				
No. of times isolated ...	1	3	2	2				
Bact. aerogenes No. of times isolated ...	0							

TABLE XV

SHOWING THE DISTRIBUTION OF THE DIFFERENT COLIFORM STRAINS RECOVERED FROM TWO OR MORE DIFFERENT ORGANS OF THE SAME CALF

	Bact. coli types								Intermediate types				*Bact. aerogenes*
	1	2	3	4	5	6	7	8	1	2	3	4	
Calf 52													
No. of organs from which strains were examined						1				1			6
Calf 55* " "						1	-						1
" 57* " "								1					1
" 63* " "	1												1
" 65 " "	1							1			1		1
" 109 " "				12									

* Both strains isolated from bone marrow.

BACTERICIDAL TESTS

In view of the important role assigned to *Bact. coli* in the diseases of young calves, the bactericidal property of the blood of calves against that organism was tested.

Broth cultures of *Bact. coli*, incubated for six hours and kept in the cold overnight, were used. Saline dilutions of culture were made and 0·1 c.c. quantities were added to 1 c.c. volumes of blood or plasma in small tubes. Duplicate sets of tubes were inoculated with each dilution of culture and sealed in the flame. After mixing, one set was sown without delay on to the surface of McConkey agar. The other set was placed in a rotating machine and incubated at 37° C. for three hours. It was then sown on to McConkey agar. This medium had been poured into enamel trays and the surface divided into parallel areas by inserting thin strips of sterile glass into the agar. Each area was inoculated with 0·5 c.c. of the culture and blood mixture, which was evenly distributed over the surface of the agar with a glass spreader. The surface of the medium was protected by covering it with an inverted enamel tray, the two trays functioning as an enlarged petri dish. The cultures were incubated for 18 hours before the colonies were counted.

In a preliminary test the bactericidal properties of the defibrinated blood, and the plasma from a four weeks old healthy calf were tested on the day of bleeding, and after keeping the blood and plasma in the cold for three days. The defibrinated bloods and plasmas were bactericidal, the blood tested at the time of bleeding being the most active. These preliminary tests were made with a "grey" strain of *Bact. coli*. A number of strains were then tested against the defibrinated blood of four calves from two to four weeks of age. The results of the test are summarised in Table XVI.

The blood from all four calves was bactericidal for all the strains tested whether grey or mucoid. If the strains varied in their resistance this was not demonstrated by the tests made. All the calves so far examined had passed the critical stage of early life when deaths are most frequent and diarrhoea not uncommon. The blood from younger animals was next examined and the results are shown in Table XVII (over-leaf).

The blood of young calves, including those tested on the first day of life and before the ingestion of colostrum, was bactericidal to a degree comparable to that of the blood of older animals. It may be noted that among the day-old calves whose blood was tested, Nos. 51 and 52 were born early in March when all the colostrum deprived calves died, and these two animals which had not received colostrum died when a few days old, and in both cases the *post-mortem* examinations indicated that they had had a *Bact. coli* septicaemia.

DISCUSSION

In 1922 Smith and Little's (1922, a) classical paper reporting the protective action of colostrum for the newborn calf was published, the paper following closely upon the demonstration by Little and Orcutt (1920) of the absorption by the calf of agglutinins for *Brucella abortus* from ingested colostrum. This latter work was confirmed by Orcutt and Howe (1922) who showed that agglutinins and globulins from the colostrum appeared simultaneously in the calf's blood. Smith and Little (1922, b) reported experiments where calves deprived of colostrum were fed and injected with cow's serum and state, "The rapid absorption into the blood of agglutinins towards *Bacillus abortus* ingested in the colostrum indicated that the immunity of

TABLE XVI

THE BACTERICIDAL ACTION OF THE DEFIBRINATED BLOOD OF CALVES FROM TWO TO FOUR WEEKS OF AGE

Strain of *Bact. coli*	Dilution	Type of colony	Calf 20—4 weeks old		Calf 21—3 weeks old		Calf 32—2 weeks old		Calf 33—2 weeks old	
			No. of colonies from control mixture	No. of colonies from incubated mixture	No. of colonies from control mixture	No. of colonies from incubated mixture	No. of colonies from control mixture	No. of colonies from incubated mixture	No. of colonies from control mixture	No. of colonies from incubated mixture
71	A	Grey	560	19	559	3	259	—	194	6
71	B	"	220	—	265	—	130	—	72	—
151	A	"	460	27	491	2	328	5	194	6
151	B	"	267	10	238	—	163	1	72	2
R	A	Mucoid	350	4	449	1	262	—	198	2
R	B	"	184	—	191	—	128	—	55	1
T	A	"	318	—	373	—	352	—	131	2
T	B	"	126	—	198	—	173	—	62	—
D	A	"	411	3	437	1	385	3	232	1
D	B	"	232	1	221	—	171	1	104	—
H	A	"					291	—	336	11
H	B	"					111	—	127	5

TABLE XVII

THE BACTERICIDAL ACTION OF THE DEFIBRINATED BLOOD OF CALVES FROM ONE TO FIVE DAYS OLD

Strain of *Bact. coli*	Dilution	Types of colony	CALVES FED COLOSTRUM				CALVES BLED ON FIRST DAY OF LIFE AND BEFORE FEEDING COLOSTRUM			
			Calf 22—bled on fifth day		Calf 23—bled on third day		Calf 50—bled on first day		Calf 25	
			No. of colonies from control mixture	No. of colonies from incubated mixture	No. of colonies from control mixture	No. of colonies from incubated mixture	No. of colonies from control mixture	No. of colonies from incubated mixture	No. of colonies from control mixture	No. of colonies from incubated mixture
S	A	Grey	183	1	204	18				
S	B	"	93	86	86	—				
R	A	Mucoid					567	26		
R	B	"					271	18		
H	A	"							233	13
H	B	"							164	5
			CALVES BLED ON FIRST DAY OF LIFE AND BEFORE FEEDING COLOSTRUM							
			Calf 26		Calf 27		Calf 51		Calf 52	
S	A	Grey								
S	B	"								
R	A	Mucoid					600	10	333	12
R	B	"					268	—	104	2
H	A	"	254	32	676	8				
H	B	"	120	10	247	3				

the calves receiving colostrum is due to protective antibodies which tend to accumulate in the colostrum up to the time of parturition." It is apparent that the authors referred to antibodies against bacterial infections of the newborn calf of which *Bact. coli* was of paramount importance. Smith and Little (1930) fed calves with large amounts of normal cow serum and serum from cows immunised against *Bact. coli* and concluded that both types of serum in sufficient quantity could replace colostrum. When serum was used as a substitute for colostrum they (Smith and Little, 1930) advocated using a serum from an animal in the same herd or district, postulating that such sera would be the more likely to contain antibodies to local pathogenic strains of *Bact. coli*. The work of the above authors established the view that the protective action of colostrum is attributable to bacterial antibody, and lent support to the use of immune serum in the treatment and attempted prevention of disease in young calves—serum the value of which is hypothetically dependent upon antibody against different antigenic strains of *Bact. coli* isolated from calves (Wramby, 1948).

When Smith and Little (1922, b) fed or inoculated calves with relatively small quantities of cow serum 50 per cent. of the animals died, but it was claimed that serum treatment had prevented invasion and multiplication of *Bact. coli* in the internal organs, and they mention similar experiences in the examination of colostrum-fed calves that died of scours in the field. Table XIII in this report shows that in a number of fatal cases a bacterial infection was absent or if present was not generalised. Deaths not caused by a bacterial infection of the tissues occur, and even in some cases where there has been no diarrhoea or where diarrhoea has been mild and of short duration. In such cases *Bact. coli* has not been shown to invade and injure the tissues of the alimentary tract nor to produce toxin absorbed from the alimentary tract; meantime the primary aetiological rôle of *Bact. coli* is open to question.

The first two weeks of the calf's life are the most precarious. In the present experiments those calves, deprived of colostrum or fractions thereof and receiving no supplementary treatment, that survived the first two weeks, gained in weight and vigour during the third and subsequent weeks of life. These animals were not the recipients of immune bodies against bacteria or their toxins, and the possibility of an active immunity having developed by the end of the second week against the strains of *Bact. coli* to which the calves were exposed, is so remote that it may be dismissed without consideration. The resistance of the calf deprived of colostrum at the end of the second week cannot be attributed to passively or actively acquired antibody to *Bact. coli*.

It has been shown (Table XII) that agglutinin to *Br. abortus* acquired by the calf either by ingestion or inoculation of immune serum is dropping in titre during the third week. Presumably immune bodies derived from the colostrum would drop in titre in a similar way. Nevertheless, when this drop occurs, the calf enjoys an increased resistance to disease, which further demonstrates the improbability of specific immune bodies against bacteria being responsible for the enhanced resistance.

A bacterial immunity in a susceptible species will generally be broken down by exposure to a heavy or repeated infection, but attempts to produce disease in colostrum fed calves by prolonged and excessive feeding of a number of different calf strains of *Bact. coli* failed. This failure is more compatible with a species resistance than with a passive or actively acquired anti-bacterial immunity.

The inability to demonstrate gradations in the bactericidal action of blood before and after feeding colostrum, and from the first day of life until the animal was one month old, lends no support to the view that resistance is associated with the possession of immune bodies against *Bact. coli*.

The enhanced resistance after the second week, the probability that an antibacterial immunity, if ever present, is declining as resistance increases, and the inability to cause disease by feeding cultures of *Bact. coli* are all incompatible with the view that specific immune bodies against

Bact. coli protect the calf against disease caused by that organism.

The insusceptibility to *Bact. coli* infection developed by the calf after the second week of life is comparable to the insusceptibility shown by a species immune animal. The calf born without this species immunity acquires it from the ingestion of colostrum, but the calves that have not received colostrum which survive the first two weeks of life have, to an effective degree, developed their species immunity to *Bact. coli*.

It was shown that the subcutaneous injection of serum was more effective than the feeding of serum in transferring immune bodies to the calf. The experiments failed to show whether feeding or injection of serum (or of whey from colostrum) afforded the better protection, but if it were demonstrated that feeding conferred the better protection and the superiority was independent of the antibody titre of the calf's blood, it would provide additional evidence that immune bodies against bacteria are not of protective moment.

The wide variations in the susceptibility of calves deprived of colostrum call for consideration. Had mortality been confined to any one time of the year a seasonal influence might have been suspected. Deaths, however, occurred in January, March, April, May, September and October, and some other explanation should be sought.

The six calves born in December and January were fed with milk from two cows, one of which calved on November 1st and the other on the 17th. Five December calves lived, but the sixth calf born on January 21st was killed *in extremis*.

A third cow at the Institute calved on January 24th and her milk, mixed with that of the two cows already mentioned, was fed to calves born from March to May. This third cow had calved for nearly six weeks before any of its milk was fed to the calves and during March its milk was mixed with that of the other cows in a ratio of less than 3:4. From March to June the mortality was very high among the calves receiving this mixed milk (see Table XI).

Calves born in July were fed with milk from a cow that calved on May 21st, the calves being born at a time when the cow had been in lactation for six to seven weeks. Those calves remained well. Milk from the same cow collected from July 25th to August 19th, during the tenth to 14th weeks of lactation, was fed to four calves born in October. The calves survived the first two critical weeks of life and during the third week all gained weight satisfactorily. Later, during September and October, the fresh milk from this cow failed to support life.

One October calf was fed with fresh milk at the first two meals, thereafter the milk stored since July and August was fed. This calf died.

These findings suggest that the quality of the milk fed to calves may influence the animal's resistance to disease, milk from cows in early lactation being able, to a varying degree, to replace colostrum, whereas milk from a later stage in lactation cannot do so.

Summary

Pooled colostrum kept at −15° C., thawed and pasteurised before feeding to calves, was an effective substitute for fresh colostrum.

Calves deprived of colostrum may survive and may enjoy good health. Their survival and health may depend on the quality of the milk fed to the animals, and it is suggested that milk from cows in an early stage of lactation may be able to replace colostrum whereas milk from later stages of lactation cannot.

Those calves that were deprived of colostrum and survived, gained in strength and vigour after the second week of life.

A limited number of tests was made on the value of cow serum, calf serum, milk whey, and colostrum whey as substitutes for colostrum. Indications were obtained that cow serum, and colostrum whey, though not so valuable as colostrum, might to some extent replace it.

A few trials were made comparing the effects of administering cow serum and also whey from colostrum by feeding and by subcutaneous injection, but the numbers of calves used were insufficient to show whether one methhod of administration was more effective than the other in protecting the calf against disease. It was shown, however, that the subcutaneous injection of *Br. abortus* immune serum was more effective than the feeding of the serum in raising the titre of agglutinins to *Br. abortus* in the calf's blood. Agglutinins in the calf's blood had declined in titre by the third week of life.

During the winter, the weather however, not being severe, calves were kept in loose boxes with cement floors which were very scantily bedded with straw. Despite this bad husbandry, practised from the third to the 14th day of life, the animals survived.

When a large number of *Bact. coli* was fed to a normal calf the strain fed could be cultivated a short time later from the lymph glands draining the small intestine. Nevertheless, normal calves fed repeatedly with very large numbers of *Bact. coli* showed no disturbance in health.

The defibrinated blood of calves was bactericidal for both grey and mucoid strains of *Bact. coli* recovered from calves. The bactericidal property of the blood was not enhanced by the feeding of colostrum and appeared to be similar for animals ranging from one day to one month in age.

The resistance or immunity enjoyed by the calf, either as a result of the ingestion of colostrum or acquired in other ways, is discussed and it is suggested that immunity, in so far as *Bact. coli* infections are concerned, is independent of immune bodies to that organism and that it is an immunity comparable to that of a species resistant animal.

Acknowledgment.—I thank Mr. George Brown for technical assistance.

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Addresses of Disease-Infected Premises

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Foot-and-Mouth Disease:

Derbyshire.—Meadow Farm, Horsley Woodhouse, Derby (February 9th).

Essex.—Roundbush Farm, Mundon, Chelmsford, Essex (Feb. 12th).

DIAGNOSIS OF RINGWORM BY DIFFERENTIAL STAINING TECHNIQUE

BY

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Many practitioners who have examined material from suspected ringworm cases, by ordinary direct methods, will have found it difficult on occasions to arrive at a positive diagnosis. In such cases, however, there is usually sufficient evidence to raise suspicion of ringworm infection. Previous treatment may have obscured obvious signs, or the fungus and lesions may not have reached a recognisable state. In view of this difficulty, a method was sought which would facilitate diagnosis.

Material from the suspected animal is placed for convenience on a slide or in a watch-glass. The hair is washed for a few moments in ether to remove fats and then bleached for about ten minutes in hydrogen peroxide (10 vols.). After draining, the hair is stained for five to ten minutes with a mixture of 5 per cent. alcoholic gentian violet solution (10 parts) and aniline water (20 parts). The stain is then poured away and Gram's iodine solution applied for three to four minutes as a mordant.

The material is decolorised in aniline oil, the process being controlled under the microscope; ten to 20 minutes is the period usually required. For the purposes of preservation, the material is finally washed in xylol and mounted in Canada balsam.

The fungus alone retains the dye and affected hairs are readily found under the microscope. The abnormal features of the hair are not masked and the presence of hyphae and other elements of fungus is denoted by the blue staining reaction. Spores are particularly well stained and the method is applicable to all forms of ringworm infecting domesticated animals.

At first glance, the process appears too complex to be of practical value but closer inspection will show that the technique is simple and the reagents few in number. The time factor is not excessive and if reserved for the indefinite case, the method should prove of considerable value.

Reagents

Ether.

Hydrogen peroxide 10 vols.

Five per cent. alcoholic gentian violet solution.

Aniline water, made by adding 2 c.c. of aniline oil to 100 c.c. of distilled water, shaking vigorously for a few minutes and filtering.

Pure aniline, a thin, oily substance.

(The aniline water is added to the gentian violet solution shortly before use as the mixture has poor keeping qualities

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Scholarships Abroad, 1950-51, issued by the British Council, 3, Hanover Street, W.1, contains particulars of grants made by overseas governments for studies in their countries by British nationals. As a general rule the graduate or student must spend eight months at least in the country concerned, and preferably must have a sufficient knowledge of the language. Facilities for veterinary studies appear to be catered for best in Belgium, Denmark, France, Italy, the Netherlands, and Sweden.

* * * * *

Weekly Wisdom

Once the Creator has been brought back to preside, the scheme of things can be completed without mishap.—The Times, epitomising the philosophy of Descartes, the third centenary of whose death was commemorated on Saturday last.

CLINICAL COMMUNICATION

METAL PLATING A FRACTURE AND THE TREATMENT OF IMPERFECT UNION

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I, like many of my colleagues, was exceedingly impressed by the numerous instances of success recorded by speakers at the International Veterinary Congress, in the modern methods of fracture repair.

The first opportunity of adopting one or other of these methods in my own practice was presented when a five-year-old racing greyhound struck a hurdle at full speed and smashed the radius and ulna so completely that the leg was dangling only by the skin and tendons, and the proximal portions of the bones were protruding through a large wound.

The radial vein was ruptured causing great complication from recurring haemorrhage for two or three weeks. The tissues were greatly contused and swollen, and the dog very obviously in much pain.

Quantities of dirt, hair and grass had got into the wound, and the onlookers took it for granted that the dog would be destroyed. Both the dog and its owner were unknown to me and I did not even know whether the animal was worth saving (from a racing and economic point of view). I learned later that the dog was not a good one and that the owner would have preferred it put to sleep rather than have to keep it for weeks, incurring expense.

An attempt at manual reduction was made and the limb enclosed in a gypsona cast (with a large window) and reinforced by an aluminium splint.

Fig. 1 shows the imperfect result of such measures, although one might have concluded from the appearance and manipulation of it that reduction had been satisfactory. This is only another illustration of the value of radiography, which so surely reveals unsuspected imperfections.

As after three days the swelling had not subsided, and the dog was so pained and restless, I decided to plate the fractured radius, believing that if its fragments were reduced and aligned, then those of the ulna would automatically dispose themselves in a normal position, and this proved to be the case.

Under nembutal anaesthesia, the existing wound on the antero-medial surface was enlarged to a length of 3 inches, and the site of fracture exposed.

After complete reduction, a four-holed vitallium Sherman plate, 2½ inches long, was shaped and made to fit snug along the bone shaft; and whilst held in position with bone forceps, four holes were drilled through both cortices, *i.e.*, from one side of the shaft to the other. It has been recommended that for greater strength, screws should enter both cortices. Three-quarter inch Sherman screws of a bore corresponding with that of the silver twist drill (⅛ inch) were then screwed into the holes with a special type of stainless steel screwdriver which not only turns the screws but also holds them. The plate was thus securely held. I only realised, by a subsequent radiograph, that the screws were really too short; but I had no choice as there were no alternative sizes available. As far as one could see, reduction had been perfect and figure 2 seemed to substantiate the success of the operation; but a lateral radiograph (fig. 3) showed a slight deviation from the straight line, yet not enough to hamper the ultimate usefulness of the limb. The operation throughout was difficult on

H. KIRK : Fracture Repair By Metal Plating

FIG. 1.—The imperfectly reduced fracture seen through plaster and an aluminium splint.

FIG. 2.—The same fracture now in perfect alignment after affixing a vitallium plate.

FIG. 3.—Lateral view showing almost perfect reduction in this plane.

X-rays by H. Kirk.

account of the pulpy state of all the soft tissues involved, and the unceasing haemorrhage. Tourniquets, ligatures and other devices were ineffective, as even the suture needle holes oozed blood. Penicillin powder was dusted into the wound, and the latter closed with catgut. Penicillin gauze was applied outside the wound, and retained by a bandage.

Normally, my plan would have been to enclose the whole limb in a plaster cast, but in view of the haemorrhage this idea was abandoned. Instead, a gypsona cast was applied from the elbow to mid-shaft, and another one from the carpus to the foot, the two being joined by a cedar-wood splint from elbow to foot. The wound area was bound with dry bandage as it was obvious new dressings would be needed for several days.

Intramuscular injections of avlo-procil (penicillin in oil) —(300,000 units) were given every 12 hours for three days.

The dog after operation was apparently out of pain, bright and feeding well, and never looked back.

Vitallium plates and screws may be left *in situ* permanently as they set up no reactions whatever ; but they must be covered by a sufficiency of muscular tissue. If, as in this case, a plate is near the skin, then it should be removed. So at the end of a month I removed the plate, but saw no evidence of callus formation. Therefore the plaster cast was not disturbed. Two weeks later X-rays revealed that there was still no sign of new bone formation. This delayed union was reported to the owner together with suggestions for measures which could be taken to expedite union [*discussed below*]; but he refused to shoulder any further expense and instructed me to destroy the dog. This was a disappointing end to a satisfactory beginning. Yet it taught me quite conclusively, not from hearsay but from personal experience, that bone operations could be undertaken without the fear of sepsis formerly attached to them, before the advent of penicillin. That statement, however, is of course based upon the understanding that the technique must be an aseptic one throughout.

It must not be thought that any of these operations of plating, pinning or the application of Kirschner Ehmer splints can be lightly undertaken by the single-handed busy clinician, as a very great deal of preparation is involved, beside attention to a mass of detail. In well equipped hospitals with an autoclave and three or four trained assistants, the surgeon is relieved of all the tedious preliminaries, and anaesthetisation, and can carry on with the main task as soon as all is ready.

In the interests of the owner and the patient, and incidentally, of our own prestige, veterinary surgeons who have neither the time nor facility for modern treatment of severe fractures, would be well advised to refer them to some hospital or clinic where such methods are practised.

Imperfect Fracture-union

This is a phenomenon which seems to occur rather more often than is generally realised, especially when an animal is over the age of about five.

The mere administration of calcium is wholly inadequate and the addition of phosphorus is imperative, but they must be in correct ratio, *i.e.*, 1·3 : 1·0. To attain these requirements I usually prescribe di-calcium phosphate in dosage of five to 20 grs. daily, though always in combination with vitamin D.

Several months ago another greyhound fractured a radius and ulna which was manually reduced and placed in plaster. Fractured canine bones frequently unite within two to three weeks, so in this case at the fourth week it was thought safe to remove the cast. But to be on the safe side, the bone was radiographed and seen to be un-united. Upon removal of the cast there was felt to be a soft union, or what is often called a " rubber-joint."

About that time I became aware that the medical fraternity* had had some success with imperfect fracture-union by the administration of testosterone. Accordingly, I secured an " implant " of this hormone from Organon Laboratories and inserted this in the subcutaneous tissue of the greyhound's neck. It was most gratifying to find, in a radiograph taken three weeks later, that ample new bone tissue had been laid down around the fracture site.

I was desirous of repeating this interesting experiment upon the dog whose bone was plated, but the owner would not hear of the cost (£2 per pellet). I hope, however, that my colleagues will put it to the test when occasion arises.

* Mosti, R. (1939.) Testosterone propionate ; its action on consolidation of fractures in old age. *Ann. Ital. de chir.*, **18.** 281.

ABSTRACT

[**Formalin Solution as a Haemostatic Agent.** Weir, G. K. (1949.) *Canad. J. comp. Med.* **13.** 125-127.

The advent of sulphonamides and antibiotics has obscured the fact that formalin was once the most widely used and one of the most reliable medicaments in the treatment of bovine mastitis. The author here is more concerned with the action of a 2 per cent. intravenous solution in combating haemorrhage within the udder of freshly calved cows.

Approaching the subject from an entirely different angle from that of the endocrine school he endeavoured to raise the thrombin content of the blood, and thus to accelerate clotting. Of ten cows treated nine gave normal milk by the fifth milking after receiving 500 c.c. solution administered intravenously with the strictest regard to technique and asepsis. The tenth animal required a second similar dose at the third day.

Mention is also made of the value of 2 c.c. of 2 per cent. formalin intraperitoneally in the treatment of deep haemorrhage in the bitch after spaying.

J. P.

BRX CLUB

Annual Meeting and Dinner

As will be seen in the Notices columns of this issue, the BRX Club is holding its Annual Meeting and Dinner at the Royal Veterinary College on Friday, March 3rd.

This Club was founded by students of the Royal Veterinary College to perpetuate associations formed in the Home Guard during the war. As many members and potential members may have changed their addresses since the last gathering, the Secretary asks those who have not received a formal invitation to accept this notification and to inform him as soon as possible if they intend to be present.

Letters from members abroad will be very welcome for reading out at the dinner, and such absent friends may be interested to hear that the Club " Drinking Cup " will be in use on this, the first, occasion.

* * * * *

At a meeting of the Stafford Rural Council, Miss V. H. Hargreaves asked for an assurance that a mechanical killer was always used when a licence for killing was granted by the Council. She was told that the Slaughtering of Animals Act applied only to official slaughterhouses, where the mechanical killer was an obligation. If the Council refused a licence the person could still go home and kill his pig in the backyard by whatever means he chose.—*Meat Trades Journal.*

N.V.M.A. CONGRESS AT CARDIFF

Hotel Accommodation

We are advised that hotel accommodation available in Cardiff at the time of the N.V.M.A. Congress (September 3rd to 8th inclusive) is limited.

Members are urged, therefore, to book their rooms as early as possible, and to facilitate this we reproduce below particulars of such block reservations as the Provisional Committee has been able to make. They are asked to note specially :—

1. That these particular reservations are contingent on applications being received from members at least two months prior to the opening of the Congress ;
2. That applications should be made direct to the hotel concerned and *not* to the Local Secretary ; and
3. That, in making application, members should mention the fact that they are veterinary surgeons attending the Congress.

	Block Reservations			(*All nett charges*)		
	Single Rooms	*Twin-Bedded Rooms*	*Double-Bed Rooms*	*Bed and Breakfast (Single)*	*Bed and Breakfast (Double)*	*Board Per Day*
Angel Hotel, Westgate Street, Cardiff... ...	10	6	5	19/6	39/–	30/6
Alexandra Hotel, Queen Street, Cardiff ...	—	4	2	14/6	29/–	23/–
Queen's Hotel, St. Mary Street, Cardiff ...	2	11	8	16/6	33/–	24/6
Barry's Hotel, St. Mary Street, Cardiff ...	10	5	10	16/6	32/–	25/–
Sandringham Hotel, St. Mary Street, Cardiff...	12	6	3	15/–	30/–	23/–
Park Hotel, Park Place, Cardiff (Headquarters Hotel)	30	16	12	16/6	33/–	25/6
Marine Hotel, Barry Island	—	2	2	14/6	29/–	21/–
Barry Hotel, Barry	3	3	3	14/6	29/–	24/–
Esplanade Hotel, Penarth	6	6	6	15/6	31/–	25/6
	73	59	51			

ADDITIONAL HOTELS WITHOUT RESERVATIONS

We have also been furnished with the following list of additional hotels to which applications for accommodation also can be made. Here, again, the necessity for early application is stressed.

Railway Station Hotel, Station Approach, Cardiff.

Philharmonic Hotel, St. Mary Street, Cardiff.

Gwalia Hotel, Barry.

Ship Hotel, Barry.

Seafield Hotel, 14, The Parade, Barry.

PRIVATE HOTELS

" Cedars," Fidlas Road, Cardiff.
" Ashburton," 227, Newport Road, Cardiff.
Mrs. Kennett, 60, Park Place, Cardiff.
Mrs. Cleves, 8, Tydraw Road, Cardiff.
Hamilton Guest House, 82, Penylan Road, Cardiff.
Mrs. Hesbronder, 233, Allensbank Road, Cardiff.
St. David's Hotel, 103, Newport Road, Cardiff.
Mrs. Woodward, 193, Newport Road, Cardiff.
Mr. Begg, 36, Hamilton Street, Cardiff.
Mrs. Springett, 26, Column Road, Cardiff.
Lyndon Court Hotel, 191, Newport Road, Cardiff.

QUESTIONS AND ANSWERS

The submission of questions for inclusion in this column will be welcomed; they can relate to any aspect of veterinary work. For purposes of record, each question is numbered, and those submitting questions are required to furnish (not for publication) name and address.

Answers to readers' queries represent exclusively the personal opinions of the writers, and criticism of the replies will be appreciated.

All communications should be addressed to the Editor.

Tuberculin Testing : The Skin Lesion Problem

Q. 339.—*I test a number of dairy herds every six months by the double intradermal method, using tuberculin prepared at the Royal Veterinary College, London.*

I find that a certain number of animals in these herds, which are mostly self-contained, are suffering from skin lesions, and that many of these show either a doubtful or low positive raction to the test.

My problem is, how to distinguish the animals that are suffering from skin lesions only, from those that are suffering from tuberculosis, plus skin lesions.

Is the comparative test, single or double, a reliable re-test for such animals, when using avian and bovine tuberculin prepared at Weybridge Laboratories ?

A.—In assessing the significance to be attached to lesions of so-called skin tuberculosis in relation to the tuberculin test, no hard-and-fast rules can be laid down, and each case must be judged on its own merits. While it is now generally accepted that this condition is capable of sensitising an animal to tuberculin, one must guard against the animal which may be affected with skin tuberculosis and bovine tuberculosis at the same time. Consequently as a general guide in the first instance, it can be said that when testing herds where bovine tuberculosis is known to exist, it is safer to ignore skin tuberculosis as a possible cause of reactions normally requiring removal from the herd unless the incidence of bovine tuberculosis is very low. The questioner states that some of his herds are not self contained. Consequently, the importance to be attached to the response to tuberculin at the first or second test of added animals in such herds will depend not on the incidence of tuberculosis in the herds they are now in, but rather in those from which they came.

Experience appears to indicate, however, that where skin tuberculosis causes a response to tuberculin it is usually not constant, and this factor often assists in differentiating the cause of the response in herds with a good history as far as bovine tuberculosis is concerned and where skin tuberculosis is known to exist. Animals in such herds giving a reaction to tuberculin normally requiring removal quite often pass on being re-tested in 30 to 60 days from the date of the last test. Experience shows that such a procedure in selected cases is justified. For fuller information on this subject, the questioner should consult the N.V.M.A's publication No. 16.

Regarding the reliability of the comparative test using avian and mammalian tuberculins prepared at Weybridge, this method of testing was introduced in order to differentiate between specific and non-specific infections, and generally speaking it can be stated that, properly carried out and wisely interpreted, it has been very successful in freeing herds of tuberculosis.

. . . . . .

Sodium Fluoride as an Anthelmintic for Pigs

Q. 340.—*Sodium fluoride has recently come into use as an anthelmintic for pigs. What is the correct way to administer it? What is the ideal dose and for how long should dosing be continued? Are there any safeguards to adopt as regards toxicity of the drug ?*

A.—Sodium fluoride is administered in the food and pigs do not require to be starved or given purgatives before or after dosing. The drug is mixed with the total amount of food that would normally be fed to the pigs in one day and all the medicated food should be given at the morning feeding. Should any food be left over by the following morning it should be mixed with the next morning's normal food. Sodium fluoride is not very palatable, so that hunger encourages the pigs being treated to take small quantities frequently. This avoids the possibility of vomiting which will occur if pigs take too much of the medicated food at one time. The vomiting does not cause any nausea or digestive upset. Pigs being fed on dry meals are the most easily treated without complications since the drug is more unpalatable in dry meal than in sloppy food. If wet feeding is the practice on the farm it is best to restrict to a minimum the amount of water in the food at the time of dosing since, medicated sloppy food being more palatable, there is a greater likelihood of pigs taking too much of the food and vomiting afterwards, thus actually not obtaining sufficient benefit from the drug. On occasion it could happen that under such circumstances a pig might take so much of the drug that it could be poisoned. When the drug is fed in dry food it is most conveniently given at the rate of 1 per cent. of the total weight of food consumed in one day. When given in other than dry food it is best to adopt the Australian practice of estimating the dose according to the weight of the pigs, since farmers' ideas vary as to the weight of the wet food or swill necessary for pigs. If possible pigs of equal appetites should be grouped together for dosing. The dosage rates are as follows:—

Weight Range of pigs lb.	Dose in Grammes	No. of pigs to 1 oz. sodium fluoride
20	2	14
21—40	4	7
41—60	7	4
61—80	9	3
81—100	12	2⅓
101—150	15	2
151—200	20	1½
over 200	25	

The medicated food should be left until it is cleaned up and next day mixed with the normal morning food if any is left over. Dosing could be repeated within a week to ten days and again at those intervals, but that should never prove necessary since one dosing is reckoned to be 95 per cent. effective. Frequent dosing could lead to fluorine poisoning.

Toxicity can be avoided by controlling the amount of water in the food, by grouping pigs into equal groups according to appetite and finally by avoiding too frequent dosings which in any case are unnecessary.

References

Habermann, R. T., Enzie, F. D., & Foster, A. O. (1945.) *Amer. J. vet. Res.* **6.** 131-144.

Roberts, F. H. S. (1947.) *Austral. Vet. J.* **23.** 82-90.

Foster, A. O., Enzie, F. D., & Habermann, R. T. (1948.) *Amer. J. vet. Res.* **9.** 379-385.

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Growth at the Corneal-Scleral Junction in a Great Dane

Q. 341.—*A Great Dane developed in one eye, after two or three days cloudiness, a growth at the corneal-scleral*

junction, in shape and size exactly like a cat's penis. A few days later the same type of growth appeared in the other eye. What is this lesion and what line of treatment should one adopt?

A.—Very occasionally, apparently due to individual idiosyncrasy in tissue reaction, the cornea of the dog attempts to heal by granulation rather than by the usual leucocytic infiltration of its superficial layers.

It is suggested that the subject of the case quoted may have had slight abrasion of the cornea which reacted in this manner. The granulation tissue produced in such cases tends to be of an exuberant nature and the result is virtually a granuloma on the cornea.

A line of treatment which is usually successful is, the use of pulv. hydrarg. subchlor., dusted lightly on to the lesion once daily, preferably in the morning, following cleansing of the eye with some such simple agent as boracic lotion. In the evening the instillation of a few drops of a lotion comprising equal parts collosol iodine oil (Crookes) and paraff. liq. is advocated. This line of treatment usually results in rapid regression of the lesion and results are excellent.

Should medical treatment fail it may be necessary to resort to surgical removal of the granuloma. The operation is necessarily a delicate procedure and involves dissection of the tumour off the deeper corneal layers without penetration of the anterior chamber.

* * * * *

Correspondence

The Diagnosis of Pregnancy in Bovines

Sir,—Belief in the value of pregnancy diagnosis at six weeks after service has been expressed so frequently and by so many competent observers that I feel there must be some explanation for the great difference of opinion which still appears to exist on this point. One concludes that those who still cannot admit that the practice has a general validity, either assume that such ability is a subtle gift reserved for a clinical *elite*, or prefer to believe that the claimants to such proficiency are, at least, deluded. I prefer to deal only with the former assumption.

I believe, with Mr. Barrett, that the acquisition of sufficient skill to diagnose pregnancy not later than six weeks after service should be the aim of every practitioner and I can see no reason why this aim should fall short of realisation. In the teaching of a pre-eminently practical operation it is obviously difficult to translate personal experience so that it may be intelligible to the novitiate, and, while giving practical instruction on this subject, I have had frequent cause to remember my own initial difficulties to see how far, and by what means, I had overcome them.

I have reached the conclusion that my early failure to achieve the competence I now profess was due above all to a misconception of what was demanded by the term "palpation of the uterus." Rightly or wrongly, I appear to have believed my mentors to have stated that the diagnosis of pregnancy before the ninth week depended upon the recognition of changes in tonicity in one of the uterine cornua. I presumed that my finger tips would become imbued with the delicate power of tactile discrimination after a necessary probationary period, and was therefore somewhat disappointed when after three years the mystic power still evaded me. With a little more imagination I might have appreciated what I now know, that the problem is not how to recognise subtle changes in what is really palpable, but to be able to palpate that part of the organ in which the changes are distinct even to the obtuse. A brief examination of the genital tract of the cow will demonstrate that the free portions of the uterine cornua are relatively short, but that the sulcus between the two extends back several inches from the intercornuate ligament. In life the curvature of the horns is such that the intercornuate ligament and the free portions of the cornua are not readily palpable. Palpation directed to an examination of the cornua posterior to this point gives no indication of the relative size or consistency of the free portions and is virtually useless for the diagnosis of pregnancy before the eighth or ninth weeks, while it may also be responsible for failure to recognise the presence of grossly pathological changes in the cornua of the barren cow. I would particularly commend these suggestions to your correspondent in view of his remarks on the development of the uterine horns in the pregnant animal. In my experience the pregnant horn has achieved the "size of a lemon" at six weeks and for an assessment of the size of the horn at the twelfth week I would refer him to the authority of Mr. H. W. Steele Bodger, who, I seem to remember, compares it to a soda syphon, which agrees well with my own estimate.

To return to the problem of the six-week diagnosis, I feel sure that all the difficulty lies in bringing the free portions of the cornua within the hand. I personally am not satisfied unless I can palpate the whole of the cornua from the inter-cornuate ligament to the tubo-uterine junction, when examining the barren animal, but this is unnecessary for pregnancy diagnosis, as once the free portion is engaged within the hand, the changes of pregnancy are obvious. In my opinion these changes are typified at six weeks by marked local enlargement with the characteristically attenuated uterine wall enclosing obviously fluid contents. Unlike Messrs. Crosfield and Pickering, I am unwilling, at this stage of pregnancy, to be in any degree dependent upon evidence provided by secondary changes. I would suggest that the uterus is the pregnant organ and that evidence of pregnancy can only be found here.

The last difficulty remaining to me is to distinguish a fluid enlargement with foetal contents from one with purulent or exudative contents. For my differential diagnosis I rely upon palpation of the foetal membranes. These are not "pinched," but the whole of the suspected uterine-foetal sac is held gently between thumb and second finger and gradually released. The escape of the foetal membranes is abrupt, and reminiscent of the release of a gently stretched strand of poor quality elastic, and is followed, only after considerable time lag, by release of the uterine wall itself. I may say that I never use this aid after the eighth week and find it almost impracticable at the twelfth. In the absence of any one of my three criteria of pregnancy—which, in paraphrasing the classical pathologists, I like to refer to as *humor*, *tumor*, and *tremor*—I withhold diagnosis. In the absence of all, I pronounce the animal empty, and in the presence of all three I not only "express an opinion," but I assert that the animal is pregnant. This dogmatic attitude was adopted in deference to one of the many maxims of a great clinical teacher—Major A. B. Mattinson, of the Liverpool School. I remember with what fervour he requested us to state "that the horse is sound," and to avoid the equivocal, "I am of the opinion. . . ."

In conclusion, I would like to state that I rate my own diagnostic ability at about the same level as Mr. Pickering's.

I believe that pregnancy may be diagnosed readily in at least 90 per cent. of heifers at 35 days and in the same proportion of cows at 40 days. This degree of confidence is obtained without reference to the presence of a corpus luteum, which, of course, will be present in the ovaries of the cyclic suboestrous cow.

Yours faithfully,

J. L. Hancock.

Whitegates, Great Chesterford,
Essex.
February 1st. 1950.

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"Roaring" in Cattle

Sir,—Reference is made to your question, "CCC 'Roaring' in Cattle," in your April 30th, 1949, issue. We would merely like to give a report on our observations of a similar condition with which we meet here.

We encounter sporadically acute dyspnoea as a result of acute swelling of the laryngeal region, mostly in beef cattle that are being fattened for market. This is accompanied sometimes by normal temperature, but more often with some increase, not infrequently as high as 106° F. This does not appear to be contagious, but we are inclined to suspect an infectious agent, as these cases do not seem to recover spontaneously. Sodium sulphapyridine monohydrate, one grain per lb. of bodyweight, in distilled water, given intravenously or intraperitoneally, seems to be giving us very prompt results. This has been repeated at 24-hour intervals for three to four days. Other sulphonamides do not seem to have quite the same effect. Early treatment of the case is important, as the cases that are not treated for several days after the first symptoms appear do not respond as rapidly as those that are treated promptly.

You may be dealing with an entirely different condition in England, but we thought it worth while to communicate this information to you.

Yours faithfully,

L. A. Dykstra, D.V.M.
D. A. Rickards, M.R.C.V.S.

Animal Clinic and Hospital,
212, Walnut Street, Aurora. Illinois.
January 16th 1950.

REVIEW

[An Outline of Veterinary Science. Edited by F. C. MINETT. (1949.) Pp. 204. Karachi: Govt. of Pakistan. Manager of Publications. Price Rs.2/12/- or 5s.]

Written by a group of workers in India and Pakistan and edited by Dr. Minett, the book is designed as a handbook or manual for students, veterinary officers in Government service and for all those concerned with the control of disease in India. The approach is essentially practical and diseases which have not yet been recognised in India and Pakistan or which are of small importance in these countries are dealt with briefly and in small print. Lengthy discussions, irrelevant detail and references to the literature have been excluded. On account of printing difficulties and political changes the publication has been delayed and illustrations have been omitted. The copy now under review has been printed by the Government of Pakistan but we understand that a simultaneous printing is being made by the Government of India.

The delay in publication (the preface is dated 1946) has resulted in some sections not being quite up to date; for example, in dealing with mastitis the only mention of penicillin consists of one line to the effect that infusions of penicillin are now proved to be very effective in treatment of streptococcal mastitis. The subject matter is dealt with in eight sections, namely, bacterial disease; diseases caused by fungi; diseases caused by viruses; parasitology including helminths, arthropods and protozoa; nutritional and metabolic diseases; miscellaneous pathological conditions; miscellaneous subjects; and appendices.

The book can be strongly recommended particularly to those in charge of veterinary departments in tropical and semi-tropical countries. They will find it an excellent book to put into the hands of all their assistants and investigation officers. The reviewer does not know of any other book which serves this particular purpose so adequately. As in all books, mistakes have crept in but these are not very numerous. A few, however, seem worthy of notice so that they may be corrected in future editions. The statement on page 49 that bovine pleuropneumonia is "common throughout Asia" is surely wrong. It has not been recorded from Malaya, Burma, Java, Siam, Ceylon nor from any part of the Indian subcontinent except Assam. On page 123 it is stated that *Plasmodium gallinaceum* occurs in temperate countries, has been recorded in a number of wild birds and causes a fatal disease. In fact it has been recorded only from Ceylon, India and French Indo-China and the only wild bird in which it has been found is the jungle fowl. Although it does cause fatal disease in imported fowls of European breeds it seems to have very low pathogenicity for indigenous breeds of fowls. The statement on page 1 that anthrax is rare in elephants surely does not apply to Burma.

A surprising omission from the list of Filariidae is *Dirofilaria repens*, an extremely common parasite of dogs in Ceylon and other parts of Asia, the larval blood stages of which have probably often been wrongly reported as those of *D. immitis*, the heart worm of dogs.

The article on rinderpest is, as one would expect, very well done and it is of interest to note that no outbreaks in swine have been recorded in India and Pakistan. This is possibly because domestic pigs are few in number in India. Natural outbreaks in pigs can, however, occur in Asia and have been seen in Ceylon and in Siam.

In dealing with surra it is stated that naganol and antrypol are specific in treatment, which is apt to give the impression that these are two distinct substances whereas in fact they are chemically identical. This is a minor point but seems worthy of mention as there does seem to be confusion on the point in the minds of some workers. Naganol or Bayer 205 are the names used by German manufacturers while antrypol or suramin are used by British manufacturers.

The chapters on heat regulation and non-sweating in horses are particularly useful as these subjects have generally been neglected in veterinary text-books. There is a useful chapter on the principles of epidemiology and another on veterinary jurisprudence with special reference to conditions in India and Pakistan.

The book is worthy of a more attractive binding and better quality paper. These and other minor defects detract little from its value and it is sure to be widely used.

NOTES AND NEWS

Diary of Events

Feb. 21st.—Annual Meeting of the Eastern Counties Division, N.V.M.A., at Norwich (Bell Hotel), 11 a.m.

Feb. 22nd.—Meeting of the Scottish Metropolitan Division, N.V.M.A., at Edinburgh, 2.30 p.m.

Feb. 24th.—Annual Meeting of the Royal Counties Division, N.V.M.A., at Maidenhead (Skindles Hotel), 2.30 p.m.

Feb. 24th.—Annual Ball of the University of Liverpool Veterinary Society, at the Students' Union, 2, Bedford Street North, Liverpool, 3. Tickets, 7s. 6d., obtainable from Mr. L. A. Taylor, at the same address.

Mar. 1st.—Meeting of the Southern Counties Division, N.V.M.A., at Winchester (the Norman Meade), 6 p.m.

Mar. 2nd.—Meeting of the Central Division, N.V.M.A., at the Royal Veterinary College, N.W.1, 2 p.m.

Mar. 3rd.—Meeting of the South Wales Division, N.V.M.A., at Carmarthen (Dolwar Café), 2 p.m.

Mar. 3rd.—Meeting of the Lincolnshire and District Division, N.V.M.A., at Peterborough (The Grand Hotel), 2.15 p.m.

Mar. 3rd.—Annual Meeting and Dinner of the BRX Club, at the Royal Veterinary College, London, 6 p.m.

Mar. 8th.—Meeting of the Editorial Committee, N.V.M.A., 3 p.m.; meeting of the Editorial Executive Committee, 1.30 p.m.

Mar. 8th.—Meeting of the Society of Women Veterinary Surgeons at Liverpool (The Veterinary Hospital, Pembroke Gardens), 6 p.m.

Mar. 9th.—Annual Meeting of the South Eastern Division, N.V.M.A., at Maidstone (Royal Star Hotel), 2.30 p.m.

Mar. 14th.—Meeting of the East Midlands Division, N.V.M.A., at Sutton Bonington, 2 p.m.

Mar. 22nd.—Meeting of the Technical Development Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 10.30 a.m.

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The Late Mr. Alexander Johnston, M.R.C.V.S. of Fyvie

By the death at Hazledean, Fyvie, of Mr. Alexander Johnston, veterinary surgeon in the Fyvie district for more than half a century, a breeder of Clydesdales and farmer, the North-East has lost one of its outstanding figures in agriculture. Mr. Johnston, whose death we recorded with deep regret in our last issue, was one of the best-known and best-loved personalities in the Fyvie district.

At Fyvie, once the home of the Clydesdale breed, he had many famous animals under his care. One was Fyvie Sensation, which was the top-priced stallion of its day. Mr. Johnston had his own Clydesdale stud and bred the famous Clydesdale mare, Golden Bell.

In becoming a veterinary surgeon, Mr. Johnston followed in the footsteps of his father, the late Mr. Robert Johnston, who practised at Monymusk. Mr. Johnston's only son, Mr. R. W. Johnston, is carrying on the family tradition. He is a veterinary surgeon at Longside.

Eighty years of age, Mr. Johnston is survived by Mrs. Johnston. Also in the family are three daughters.

A Personal Appreciation

Well known to me for very many years by reputation; but once, and once only, was I privileged to spend one unforgettable day with Mr. Johnston, of Fyvie, Aberdeenshire. And yet, within the space of a few all too short hours, was founded a helpful and enduring friendship.

One had but to meet that tall, upright figure, stalwart in body, mind and spirit, to discern the personification of the finest qualities which characterised his generation and his proud race. And yet he was totally unaware that he was other than ordinary.

It was a day in late spring. To Mr. Johnston a routine day; to me "a busman's holiday." Visits ranged from the most humble cottage to Fyvie Castle. Again and again he would draw into the side of the road so that he might better scan stock at pasture. His was not a practice in the ordinary sense of the word—his was a personal pride in the progress of the many parishes which made up a large diocese. Who can tell, who can say, to what extent this unconcealed personal interest contributed to that international reputation for breeding and rearing of horses and cattle which, within his lifetime, developed in Aberdeenshire? "Know them in health and you will know better in disease"—truly a philosophy worthy of preservation and propagation.

Mr. Johnston practised in Fyvie for 59 years. Far and wide he was recognised for his competence in major equine surgery, and for his ability in cattle practice. Many changes must come to one in the course of a long lifetime, but it was clearly evident that he rose to meet each change time and chance presented. It was abundantly evident that he took each recent advance made in veterinary science to the bar of reason and, providing he found it acceptable, had no hesitancy in introducing a new method into his practice. No animal received into his care was ever denied the fullness of his extensive knowledge and high standard of skill.

In earlier days visits were made on horseback. His people will remember how, without regard for personal comfort or convenience, he would readily respond to a call for his services. On many occasions he would ride as far as snow-drifted or ice-bound road would permit, stable his mount at a convenient farm or forge, then, finish the journey on foot: such as know the shire in winter time will admire Mr. Johnston's courage, his fortitude.

As I write I recall the many warm, friendly welcomes extended to Mr. Johnston throughout that unforgettable day, and feel he has left us another lesson to learn; it seems to me that throughout many years of loyalty, labour and love he had gradually graduated in and through the "University of Adversity," and had the highest honour men can confer upon a man—the universal respect of the community in which he has lived and laboured. By character, capability and charity, Mr. Johnston raised himself to a status which we might envy and emulate.

While our thoughts go out to Mrs. Johnston, his daughters, his son, daughter-in-law and grandchildren, we know and feel that their personal memories alone will comfort and sustain them.

George Dykes.

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MEAT PRODUCTION IN GREAT BRITAIN

Dr. Hopkirk's Address to the Institute of Meat

Addressing the Institute of Meat on February 7th, Dr. C. S. M. Hopkirk took as his subject "Production of Meat in Great Britain from the Viewpoint of a New Zealander." He first stressed some of the points which he had made at the International Congress last year, namely:—

1. One should aim at single purpose breeds and not rely on dual purpose animals. (At a recent meeting of the International Congress on Animal Production in Paris, "it was very obvious that Europe, because of the small acreages of individual farms, favours the idea of dual and even treble purpose cattle, but this is distinctly a sign of peasant farming and should not apply in Great Britain.")
2. Dehorning is essential.
3. A.I. could be applied in beef production and, if necessary, in lamb and mutton production, just as serviceably as in dairy cow production.
4. Disease control to enhance production.

Dr. Hopkirk said that a much greater percentage of Britain's meat could be produced under improved farming conditions. It had not been the practice in this country to store home-grown meat. Yet why, in seasons of plenty, should meat not be so stored? Overseas meat came in its greatest quantity in the late winter and spring months, and was refrigerated here for use as required. Home-grown meat was at its optimum supply in the autumn and early winter, yet there was much overlapping, which could be avoided by storing any excess.

Dr. Hopkirk added that we should refuse to purchase meat at the pistol point from countries not within the Empire. Empire countries, with their deep appreciation of the position in Great Britain, and with their cheaper methods of production, should be given preference. He did not want to see South American meat pushed right off the market, but merely put in its proper place in relation to Empire produce.

With regard to hill land, the work of Lord Lovat and others all tended to show that the prime improver was the cattle beast closely followed by sheep. Cattle were good scavengers and did much to tread out and control fern and heather, and to manure the soil. Many sheep now kept on the highland farms were not assisted by cattle and therefore did not produce as they should. In New Zealand, where marginal land is being top-dressed by aeroplane, no good sheep farmer would dream of running his station without scavenger cattle—whether these paid their keep or not.

Dr. Hopkirk referred to Dr. John Hammond's suggestion that suitable older dairy cows which—on account of mastitis or for some other reason—were being culled rather too early, should be bred to a beef type bull. This would at least provide good veal. The present rigid controls were a bar to the quick growing catch crop of meat from pigs and poultry. Many men who could keep one or two pigs and a number of fowls, rearing them on scraps and only a small ration of grain, simply could not be bothered to cope with the forms and regulations.

As a veterinarian Dr. Hopkirk felt that the strongest objection should be taken to any authority which permitted the import of meat from a country from which a contagious disease was likely to be introduced. The taxpayer had to foot the bill for the eradication of foot-and-mouth disease, swine fever, and fowl pest introduced in this way. There were countries within the Empire free from these diseases.

With regard to slaughter, too many small, unclean and uninspected abattoirs were still in existence. He would like to see veterinary control of trained lay meat inspectors established, under the Ministry of Agriculture. The Ministry of Health, he thought, should make regulations for the wrapping of food—especially necessary in the filthy dust of London where so much dried dogs' excreta blew about.

G. P. W.

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NEW ZEALAND'S FOOD EXPORT DRIVE PROMISES BEING FULFILLED

The issue of *The New Zealand Government News Bulletin* of February 10th states that the Dominion's promises to increase dairy exports to Britain by 20 per cent. and meat exports by 50,000 tons a year by 1955, when the seven-year bulk purchase contract with the Ministry of Food expires, are being fulfilled.

"The Chairman of the Aid for Britain National Council (Mr. F. P. Walsh) said to-day that at the end of the first season butter exports had been increased by 11·1 per cent., and cheese exports by 14·4 per cent. There had been steady expansion in exports of preserved milk products.

"The meat position was 'rather obscure,' although there were 500,000 more breeding ewes and 1,250,000 more lambs to start the new season. These should be useful in increasing meat production. The lambing percentage in 1949 was 96·48—a record."

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

THIOPENTONE AS AN ANAESTHETIC IN THE HORSE

Sir,—With reference to Mr. Longley's report on the above subject, published in *The Veterinary Record* (**62**, 17), and subsequent correspondence, I would like to support Mr. Longley in his claims as to the efficacy and practical value of this method of anaesthesia in the horse.

During the past 18 months I have used thiopentone as an anaesthetic in the horse on six occasions, both in Kenya and since my return to this country. In fact, my intention was to publish my records when I had accumulated data from a larger number of cases; but Mr. Longley has forestalled me and there is little to add to his comprehensive report.

I am a firm convert to the use of chloral hydrate intravenously for the induction of deep narcosis or light anaesthesia for prolonged operations, having used this method on 46 cases, both equine and bovine, during the past two and a half years; but it seemed to me that an anaesthetic was needed for use in horses, which would produce short complete anaesthesia with rapid recovery, for quick operations such as castrations and dental work. I decided, there-

fore, to experiment with thiopentone but the only reference I could find regarding the use of this agent in large animals was in Wright's "Veterinary Anaesthesia" in which he describes Henderson's use of a 3 gm. dose in 800 lb. bullocks, *i.e.*, 1/13th to 1/15th grain per lb. Applying this dosage and using the thiopentone in 10 per cent. solution, I obtained good results in five horses and one donkey, the anaesthetic being administered by rapid intravenous injection in the standing position in five cases. The sixth case is mentioned later.

My rates of injection of the solution were quite tentative and varied from about ten seconds up to one minute. Recumbency and complete anaesthesia were produced in all cases, but my best results were obtained in the one case in which I administered the full dose in about ten seconds. I was very interested to see that Mr. Longley finds that this is the optimum rate of injection. In this case of mine, the horse stood for a few seconds, then sank quickly back on his haunches and rolled over on to his side, lying with head and limbs passively extended. Respirations were arrested for about 20 seconds—somewhat alarmingly as I had had so little experience of the use of this agent in the horse and I began to apply artificial respiration; this, however, was probably quite unnecessary, as after two or three applications of pressure to the ribs the respirations were resumed and continued slowly and regularly. Muscular relaxation and surgical anaesthesia were complete and the latter lasted for nine minutes, which gave me ample time to perform a simple castration. The horse regained his feet and stood steadily at 16 minutes: and at 25 minutes from the time the injection was made, he was feeding and walking round a paddock.

In my few other cases, when the injections were made more slowly, up to one minute, the subjects sank to the ground as in the above case; but anaesthesia did not develop for a minute or more after they had become recumbent, and lasted in one case up to half an hour. Delirium and violent struggling to rise were absent in all cases and as Mr. Longley states in his letter of February 3rd, the application of a little common sense animal management is all that is needed to ensure that recovery from the anaesthetic and resumption of the standing position proceeds smoothly.

In one case only, I superimposed thiopentone on chloral hydrate with good results. The subject had become recumbent, following the administration of chloral hydrate intravenously in the standing position, and was then in a state of light narcosis. At this point, my intention was to continue with the chloral injection until the full computed dose had been given but the chloral hydrate solution was accidentally spilled from the gravity feed flask. I then decided to induce anaesthesia with thiopentone and 2 gms. were injected rapidly, the subject passing quickly into complete surgical anaesthesia with full muscular relaxation. In this case the anaesthesia lasted for about 15 minutes; but recumbency was maintained for some time, owing to the narcotic dose of chloral which had been given.

The subjects on which I have used thiopentone were: four colts, all about two years old; one donkey, aged ten years, and a horse aged 19 years. The last subject behaved perfectly, and the satisfactory use in an animal of this age should be a good criterion of the safety of thiopentone.

In conclusion, I would like to congratulate Mr. Longley on his excellent report and to endorse his opinion on this method of anaesthesia. I am now satisfied, from his findings and my own limited experience, that thiopentone is an ideal short-acting anaesthetic for the horse.

Yours faithfully,

Watton, F. G. Waddington.
Norfolk.
February 12th, 1950.

* * * * *

Sir,—Mr. Longley overstates our case (*The Veterinary Record*, **62.** 82). We repeat that we have observed in recovery from thiopentone anaesthesia a very marked difference between horses and cattle. In both species consciousness was regained in a relatively short time but cattle, having apparently discovered that they were unable to get up, appeared temperamentally content to remain recumbent whereas the horses in our series made violent attempts to rise until muscular co-ordination was restored.

It is our contention that the use of the drug in the horse should be approached with more caution than anyone who had observed its effects only in cattle might think necessary.

Yours faithfully,

Research Institute, W. M. Henderson.
(Foot-and-Mouth Disease Committee), J. B. Brooksby.
Pirbright,
Surrey.
February 13th, 1950.

SULPHAMEZATHINE IN THE TREATMENT OF ENTEROTOXAEMIA IN GOATS

Sir,—During the past year sulphamezathine has been used by a number of goat keepers in Yorkshire for treating cases of enterotoxaemia and reports on its use appear to indicate that it is almost a specific if the correct dose is given. In all acute cases where the drug has been given at the rate of 1 gramme for every 10 lb. bodyweight, recovery has been spontaneous. Death—probably from poisoning—occurred in at least two acute cases in which treble that dose was given, and death also occurred in several acute cases in which very much less than the correct dose was given and in these cases it was presumed that death was from enterotoxaemia following inadequate dosage. The treatment now recommended which has proved satisfactory for acute cases is as follows: Immediately the disease is suspected or diagnosed the goat is given a full dose of the drug in a small quantity of milk. Next day a quarter of the initial dose is given every four hours until the full dose has been administered. This four hourly dosing during the day with a quarter of the dose should be continued for 24 hours after scouring has definitely ceased, usually within 48 hours of the inception of the attack. No reports have been received of scouring lasting longer except where too small doses have been used, but cases of relapse have been reported where dosing has ceased immediately the scouring has stopped.

Treatment with serum has been discontinued.

No opportunity has arisen to treat any goats affected with the peracute type of enterotoxaemia.

In the treatment of chronic cases much reduced doses have been given with good results, but it would probably be best to treat them in a manner similar to the acute cases since no ill effects have been seen following normal dosage.

This method of treatment has surmounted the anaphylactic reaction of many of the Saanen breed to injections of serum or vaccine.

It would be interesting to know the results of others who have used sulphamezathine for enterotoxaemia; also what dosage has been employed.

Yours faithfully,

Ministry of Agriculture and Fisheries, P. L. Shanks.
Quarry Dene,
Weetwood Lane,
Leeds, 6.
January 16th, 1950.

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VIABILITY OF *DEMODEX* ON TRANSFERENCE FROM SKIN TO SLIDE

Sir,—Reprinted in *The Canadian Journal of Comparative Medicine* (**13.** No. 10. October, 1949) from *The Veterinary Record* (**61.** No. 27, July, 1949) is a letter by Hamilton Kirk on demodectic mange in which it is stated ". . . but what troubles me is to know whether a *demodex*—transferred from the skin to a slide—is dead or alive. They appear never to move at any time one may observe them."

This observation is interesting. Here, in this suburb of Perth, we examine hundreds of dogs suffering from demodectic mange, the disease being very prevalent, and it is our experience that the majority of the parasites are definitely alive and moving when transferred from the skin to the slide. Usually, almost invariably in fact, we demonstrate the parasite to the owner of the dog, in order that he or she may have a better understanding of the disease from which the dog suffers; thus, whilst we have no data on the length of time the parasite lives on the slide, because we have not bothered to check this so far, it is certain that they live at least 15 minutes, since it would take about that time to demonstrate it to some clients; in fact, if the parasites did not move, the clients, inexperienced in such things, would hardly be able to be sure that they were looking at a parasite.

In this part of the world the climate is perpetually warm; in the summer months it is hot, often around the hundred degree mark or over; the winter is really a prolonged spring, quite unlike the northern winters, and is not unlike summer in some parts of Great Britain. Thus if the parasites are all dead on the slides in London, it seems possible that warmth or lack of it may have to do with their viability. It would be interesting to know how Canadian observers find things both in summer and in winter, since there we have the two extremes of heat and cold.

Yours faithfully,

2, Devon Road, T. W. Hogarth.
Swanbourne,
Western Australia.
January 27th, 1950

IS ATTESTATION A GOOD POLICY?

Sir,—The letter from Mr. L. Pitcher in your issue of February 4th, seems to me to be of the highest importance. During my years of general practice in the same county as Mr. Pitcher, I formed a hypothesis that resulted from certain observations over a generation on certain farms. Briefly the observations amounted to this: that occasionally a farm "rotten" with tuberculosis and/or contagious abortion would seem to clear of these diseases. The infections, from being a source of constant loss, ceased to be so, even to the extent of reactors to tuberculin and blood tests no longer giving positive reactions. Eventually I recognised a common denominator in these occurrences, and that was a change in the agronomy of the farms in question, usua.ly resulting from a change in ownership or tenancy.

This agronomic change was in the direction of muck and compost, and rehabilitation of pastures thereby, with abolition or greatly decreased use of artificial manures. This process, I argued, is vitalising the diet of the cattle and enabling them to reduce the pathogenic organisms they harbour to the role of symbiotes. Later on I became acquainted with the work and writings of Sir Albert Howard, and of the Soil Association, which seemed to confirm that my hypothesis had considerable backing.

It might be pertinent from another angle to mention an experience within my own family. Without any history of tuberculosis on either side, I reared my first two children on milk from a non-tested herd under my professional care, in which the husbandry was first rate, and losses from the two above-mentioned diseases were nil. My third child, being delicate from birth was, on medical advice, reared on milk from a tested herd. During his first year at prep. school he developed a lung lesion of tuberculosis and had to undergo treatment for a year—successfully, I am glad to say. The point is that all the family except this third child had daily been exposed to the possibility of ingesting tubercle bacilli, and presumably acquired a serviceable immunity. The third child had not this opportunity, and broke down on exposure during his ninth year.

I could multiply my experiences on this theme, but will content myself with the foregoing, hoping that others may have had similar experiences indicating that nutrition is the key to the problem rather than elimination of reactors from our herds.

Yours faithfully,

Springhurst, R. C. G. Hancock.
Ecchinswell.
February 4th, 1950.

. . . . .

Sir,—*Re* Mr. Pitcher's interesting theory, he has quoted so many figures that perhaps he has lost sight of the following recently given in *The Veterinary Record* (November 19th, 1949), showing the progress of the Attested Herds Scheme under the heading of "Percentage of Attested Cattle to Total Cattle": England 12·8 per cent., Scotland 38·9 per cent., Wales 29·4 per cent.

His assumption that 80 *per cent. of cattle* in Scotland as a whole are attested would appear to be based on a statement (reported in *Vet. Rec.*, January 28th, 1950) that "76 *per cent. of the total milk supply* in Scotland comes from herds free from tuberculosis"; however, this statement continues: "less than 15 per cent. goes to the public as T.T. milk. The balance is sold as undesignated milk or is mixed with ordinary milk."

One bucket of "ordinary milk" could go a long way in a 1,000 gallon tank at the mixing plant, and as Mr. Pitcher considers it probable that pasteurisation does not destroy his "tuberculin" we can therefore assume, on quite as firm ground as he does, that over 85 per cent. of Scottish milk *does* contain this substance.

We will doubtless soon be inundated with statistics that have been juggled to suit various political tastes, but let us please consider all aspects of animal health and fit our theories to facts and not the facts to theories.

Yours faithfully,

Orlesmead, Wilton, Ross-on-Wye. W. J. Daniel.
February 6th, 1950.

. . . . .

Sir,—Mr. Pitcher's figures are impressive at first glance, and as premises to his argument are irrefutable—but is the reasoning valid? Because bovine tuberculosis in Scotland has decreased and human (respiratory) tuberculosis has increased, does it, of necessity, imply that we are losing our immunity to human tuberculosis by virtue(?) of not getting "tuberculin" excreted in T.T. milk?

Must there be a relation between the human and bovine figures for Scotland and the rest of the country as he states? Surely changing industrial conditions in Scotland, during and since the war, have played a large part in the increase of human pulmonary tuberculosis; the figures give no idea of whether the increase has been among men, women or children, town or country dwellers, factory workers or shopkeepers.

The ideal, as I read Mr. Pitcher's letter, would seem to be a country with tuberculous cows, but with more frequent (three-monthly) clinical inspections to remove "open cases such as infection of the udder and coughing type because of the immediate danger to other cattle and human beings."

What, then, *is* an open case?

"It would appear that the complete healing of lung lesions which very often occurs in man seldom takes place in cattle. This is a fundamental difference, and in practice all tuberculous cattle are regarded as infectious to other cattle"[1] or human attendants (writer).

Tuberculous cows with no mammary lesions intermittently may excrete virulent organisms in the milk. Gaiger & Davies (1933) observed a cow that excreted tubercle bacilli for six months before slaughter, but they found no macroscopic or microscopic lesions in the udder.

It is well known that organisms can be excreted in the milk for months before tuberculous mastitis is detectable clinically. "Detection of the tuberculous cow by clinical methods is difficult and often impossible. Clinical inspection of dairy herds, even when very carefully performed, has done little to reduce the incidence of tuberculosis and does not safeguard the milk supply as effectively as efficient pasteurisation."[2]

As for immunity derived from milk from a tuberculous cow, I should like to know how much tuberculin one would need to drink. Would not B.C.G. vaccine be more practicable and safer?

Perhaps Mr. Pitcher prefers tuberculin in his milk—I prefer T.T. every time.

Yours faithfully,

Boroughbridge, Yorks. Richard W. Hillman.
February 8th, 1950.

References

1 and 2 John Francis. (1947.) Bovine Tuberculosis, Including a Contrast with Human Tuberculosis.

. . . . .

Sir,—In his recent letter Mr. L. Pitcher expresses the opinion that more frequent clinical examinations of dairy cattle should be made in preference to tuberculin testing. Is that the case? In my view it must not be possible for tubercle bacilli to be present in milk and the only way to ensure this is to eradicate tuberculosis from our dairy herds.

If bovine tuberculin is of use in conferring a partial immunity against the human type, which I doubt, then could it not be added to milk after pasteurisation, or perhaps tuberculin capsules could be taken as required?

Quoting figures on the increase of respiratory tuberculosis in Scotland is rather misleading, as over one-third of the rise occurred in one city—Glasgow—whose slums are almost ideal for the spread of this condition. Incidentally, Glasgow gets part of its milk from Northern Ireland. Also these figures show that the drop in bovine tuberculosis per 100,000 in man is greater than the increase of human type infection.

One of the National Association for the Prevention of Tuberculosis extracts quoted was: "More than 2,500 patients with grave tuberculosis await sanatorium treatment in Scotland." Surely here lies the answer to the increase of tuberculosis in Scotland: many open cases, most living in unenviable surroundings, all potential sources of infection, actively spreading the disease to their families and friends. If nurses and beds were available in sanatoria for these people it would not be long before the incidence of human tuberculosis was on the wane.

Yours faithfully,

K. G. Luckin,
Streatley House, Streatley, Berks. *First Year Student.*
January 6th, 1950.

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ELECTROCUTION AT LOW VOLTAGE

Sir,—Mr. Peele's article should offer great possibilities to those engaged in colliery practice.

In 1912 the veterinary surgeon employed by a well-known colliery in South Wales was very concerned at the lack of knowledge of his lay staff, who might be called to put a horse "down," underground, in his absence.

While I understand that it is only upon haulage roads that signal wires are found, it may be possible to take leads to the scene of the accident, with large copper terminals to place in the mouth; warm saline would assist.

Yours faithfully,

50, High Street, Coleshill, Warwicks. Ivor Hughes.
January 30th, 1950. *Veterinary Practitioner.*